US Army Corps of Engineers

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

BONNEVILLE POWER ADMINISTRATION

CITIZEN'S GUIDE TO THE

2016 Comprehensive Evaluation

Protecting Salmon and Steelhead in the Columbia River Basin

EIGHT YEARS OF PROGRESS UNDER THE 2008 FEDERAL COLUMBIA RIVER POWER SYSTEM BIOLOGICAL OPINION

The Columbia River Basin

Federal dams on the Columbia and Snake rivers helped shape the modern Northwest, fueling the economy with affordable electricity, reducing the risk of flood damage, enabling safe navigation and irrigating crops to feed the nation. But they also affected the salmon and steelhead that migrate from the Columbia River Basin to the ocean and back. These fish had already been affected by more than a century of commercial fishing, mining and human development.

In the 1990s NOAA Fisheries listed the first Northwest salmon and steelhead under the Endangered Species Act, or ESA. Eventually 13 stocks in the Columbia River Basin were listed as threatened or endangered.

Under the ESA, the U.S. Army Corps of Engineers, the Bureau of Reclamation and the Bonneville Power Administration—collectively called the Action Agencies—must consult with NOAA Fisheries to avoid jeopardizing listed fish. NOAA Fisheries' Biological Opinion guides operation of the 14 federal dams shown here in red and known collectively as the Columbia River System, to protect ESA-listed fish.

The Action Agencies work with states, tribes and others across the region to protect fish affected by the dams and restore the habitat on which they rely.

The Action Agencies currently fund more than $500 million in actions each year to benefit fish and wildlife. Funding is provided by the electric ratepayers who purchase the power produced by these federal dams, as well as by federal taxpayers who fund activities for nonpower project purposes such as flood risk management and navigation.

- Federal Dams
- Nonfederal Dams
- Canadian Dams

50 mi
100 km

Listed Fish Species

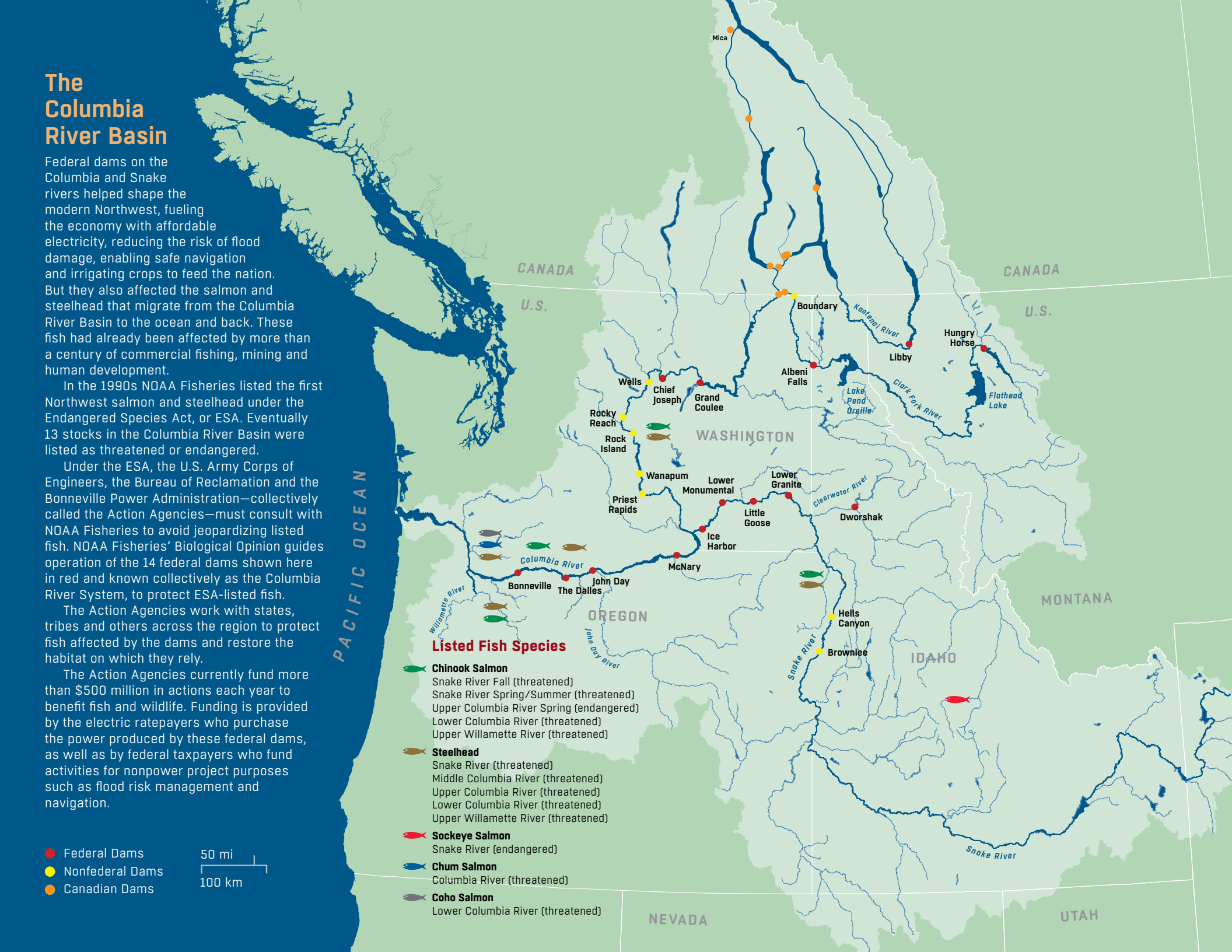
Chinook Salmon
Snake River Fall (threatened)
Snake River Spring/Summer (threatened)
Upper Columbia River Spring (endangered)
Lower Columbia River (threatened)
Upper Willamette River (threatened)

Steelhead
Snake River (threatened)
Middle Columbia River (threatened)
Upper Columbia River (threatened)
Lower Columbia River (threatened)
Upper Willamette River (threatened)

Sockeye Salmon
Snake River (endangered)

Chum Salmon
Columbia River (threatened)

Coho Salmon
Lower Columbia River (threatened)



Working together to bring fish back to Columbia Basin rivers

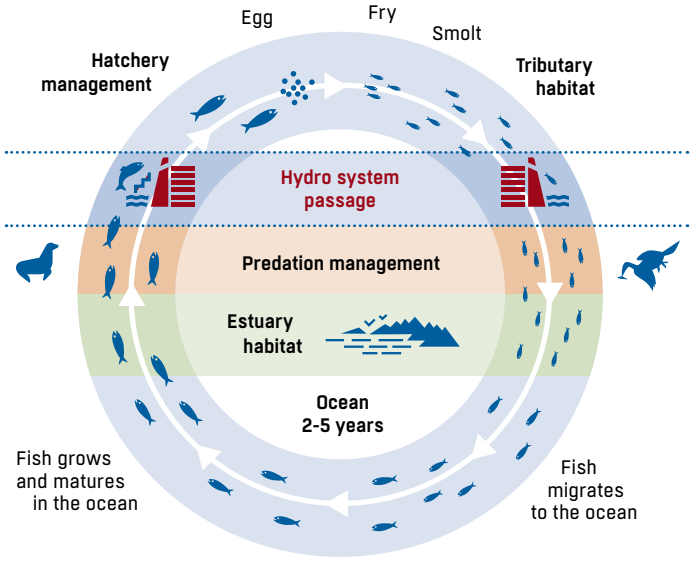
This Citizen's Guide highlights eight years of accomplishments described in the Comprehensive Evaluation—a progress report on the work by the U.S. Army Corps of Engineers, Bureau of Reclamation and Bonneville Power Administration to protect ESA-listed salmon and steelhead.

The Action Agencies and their partners are helping expand the abundance and reach of Columbia and Snake river salmon and steelhead by making these multipurpose federal dams safer for fish, removing barriers to fish migration in tributaries, reducing juvenile fish travel time, managing predators, and restoring tributary and estuary floodplain habitat.

More fish—and more wild fish—are returning to the river. Today, the combination of natural-origin and hatchery-origin adult fish returning from the ocean is higher than in the 1990s and since dam counts first began in 1938.

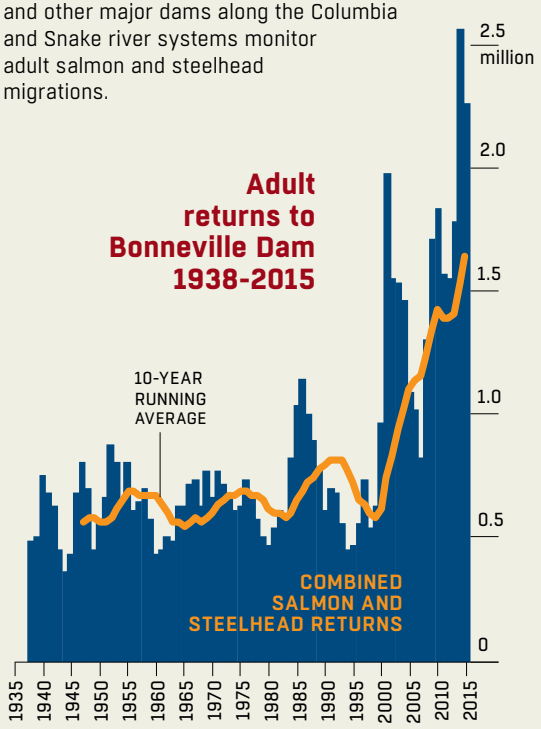
The federal effort to protect these fish is one of the largest of its kind in the nation, and its success hinges on collaboration and partnerships—with tribal, state, local and nongovernment organizations. Together, agencies and partners have increased survival of fish passing mainstem dams and returned fish to tributaries where they had been absent for decades.

Even with these extensive efforts, the Action Agencies and NOAA Fisheries have not yet cleared the bar set by the Endangered Species Act, according to a remand in 2016 by the U.S. District Court for the District of Oregon. The Action Agencies are reviewing their actions in consultation with NOAA and the U. S. Fish and Wildlife Service to develop new biological opinions on system operations in 2018. The Action Agencies are also working to develop a new environmental impact statement under the National Environmental Policy Act to explore alternatives for operating the system. The Action Agencies will build upon the good work summarized here as they plan their next actions.



▲ The life cycle of salmon and steelhead requires the fish to rely on different environments as they grow and mature. Each life cycle stage comes with its own survival challenges, making recovery a complex issue. The Action Agencies take a comprehensive approach to addressing impacts including hydro system passage, predation management, habitat improvements and hatcheries.

A view into the fish ladder
Fish counting stations at Bonneville Dam and other major dams along the Columbia and Snake river systems monitor adult salmon and steelhead migrations.



Counts include listed and nonlisted salmon and steelhead, hatchery and wild fish.

Salmon and steelhead abundance is improving

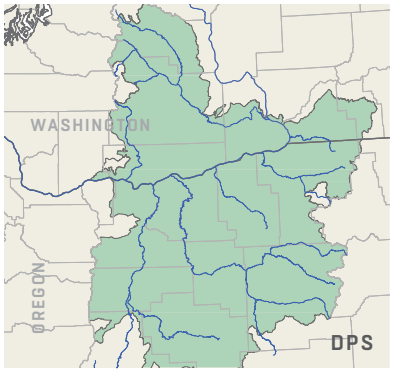
An important measure of progress is that wild, or natural-origin, salmon and steelhead are returning to spawn in Columbia River Basin streams and rivers. The Action Agencies have more than 50 projects underway to monitor the status of listed fish—by tracking their movements in streams, examining their genetics, and surveying fish numbers and their habitat.

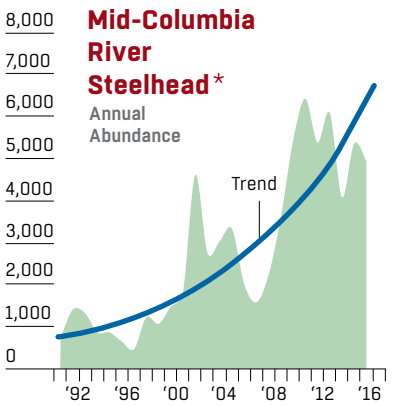
Natural-origin fish for all ESA-listed salmon and steelhead species in the Upper Columbia and Snake rivers have increased in abundance since the first ESA listings in the 1990s. On average, natural-origin chinook numbers have more than tripled and wild steelhead numbers have doubled in that time.

Listed hatchery fish (not included in the charts) display similar trends and help conserve the genetic resources of the species by providing a safety net in times of poor climate and ocean conditions.

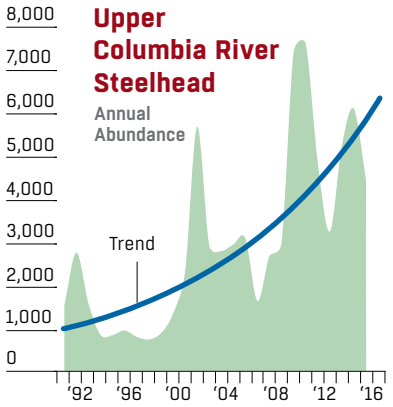
Several factors contribute to increases in abundance including fish passage improvements, reduction in travel time, habitat enhancement, harvest levels, predation management and ocean conditions.

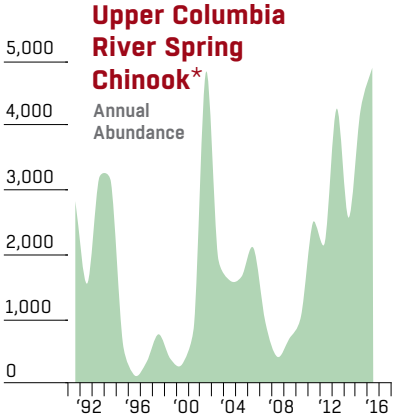
Annual variation in abundance and productivity of natural-origin populations can be substantial. Biologists consider trends to be more important than the results of any single year.





* Yakima River Major Population Group





* No statistically significant trend line

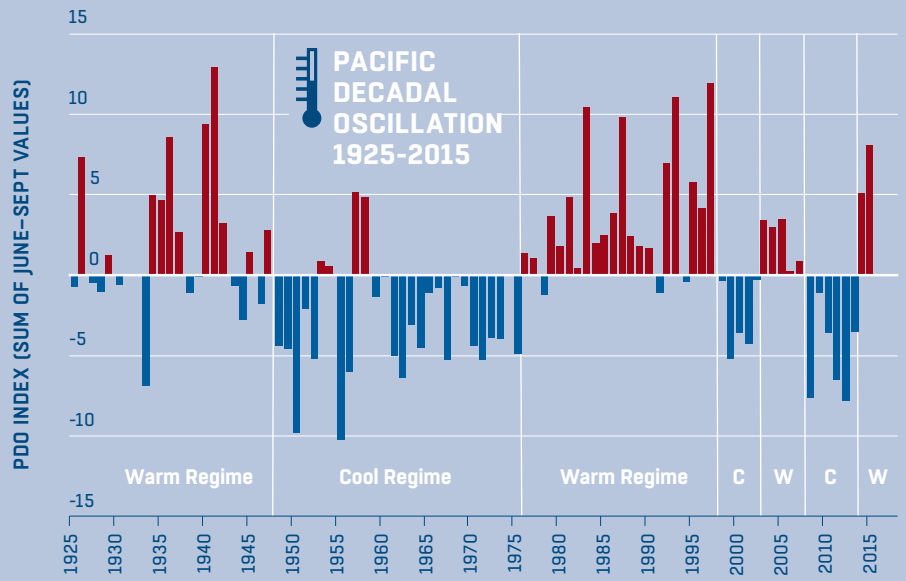
Climate and ocean conditions affect adult returns

Salmon and steelhead abundance is strongly influenced by conditions in the ocean, where they spend the majority of their lives. Warm ocean conditions impact the food chain for the fish that young salmon eat. The effects of those ocean conditions may not be fully realized until years later when fish return to freshwater as adults.

For example, increased fall chinook returns in 2015 reflected the positive conditions they experienced entering the ocean as juveniles in 2012 and 2013. However, the appearance of a "warm water blob" in Northwest coastal waters in 2014 contributed to decreased chinook salmon returns in 2016, and is expected to result in lower returns of adult chinook salmon in 2017.

The effects of ocean conditions may not be fully realized until fish return to freshwater as adults.

NOAA FISHERIES

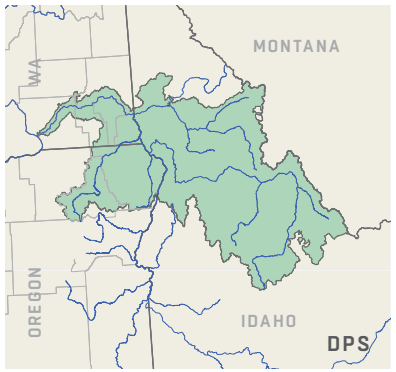


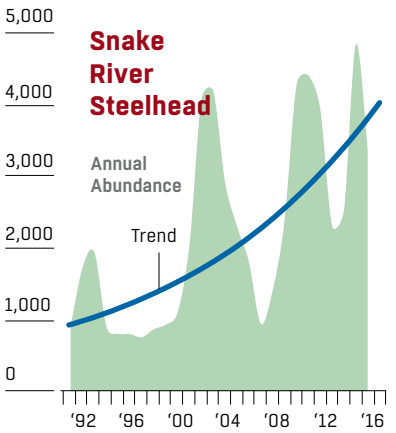
SOURCE: NOAA/JISAO

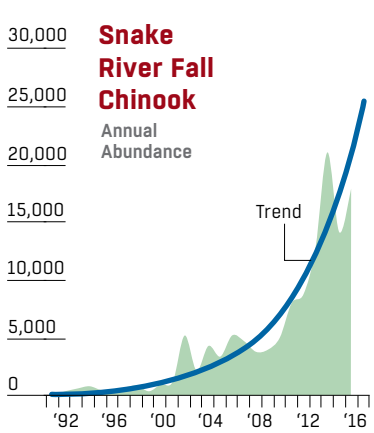
The Pacific Decadal Oscillation is a pattern of Pacific climate variability consisting of warm and cool phases. Shifts in these phases can have significant implications for global climate, temperature patterns and the productivity of marine ecosystems. Scientists have found that cool Pacific Decadal Oscillation conditions are generally more favorable for salmon and steelhead.

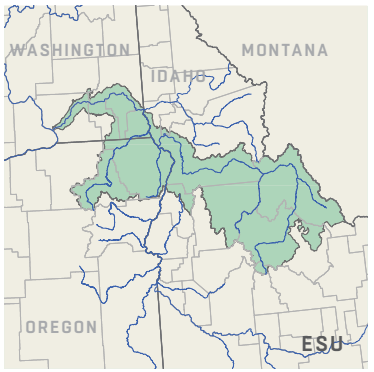
▼ These graphs show the number of natural-origin adult fish returning to spawn. They represent the most complete data available on abundance for natural-origin fish only (with the exception of the Snake River sockeye stock, which is sustained through a captive broodstock program). A statistically significant increasing trend* in abundance is illustrated in blue for six of the seven listed species.

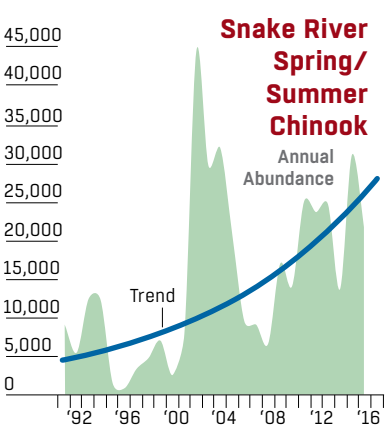
* Trend lines are shown where the 1990 to present trend is statistically significant ($p<0.05$, methodology from Good et al. 2005). This is consistent with the short term trend estimation period that NOAA Fisheries uses in the BiOp to assess the status of the fish.

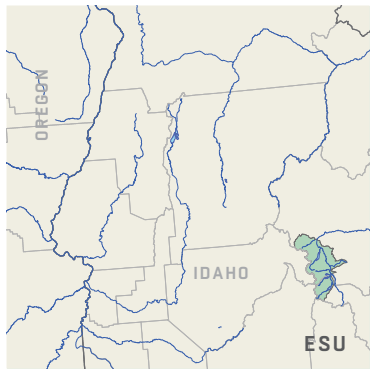


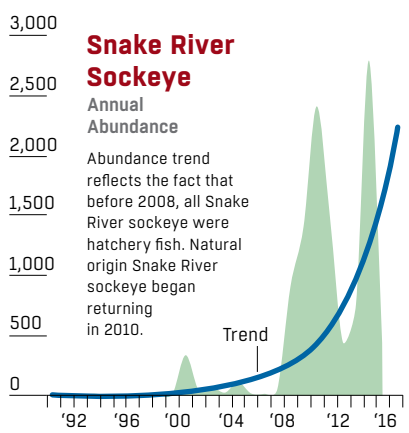












Science-based spill and structural improvements increase fish survival

Providing safe fish passage through the eight federal dams on the lower Columbia and Snake rivers is the centerpiece of Action Agency efforts.

At each dam the Action Agencies tailor the amount of spill and type of juvenile fish passage to specific fish behavior and river conditions. Spill levels are also customized to avoid delay of adult fish migrating upstream.

Surface passage routes have been installed at all eight dams on the lower Columbia and Snake rivers, allowing juvenile salmon and steelhead to pass dams near the surface where they naturally migrate. Such science-based spill operations have reduced the percentage of fish that go through turbines, decreased fish travel time and increased the overall survival of juveniles through the system. In the spring, most of the juveniles pass the dams through routes other than the turbines.

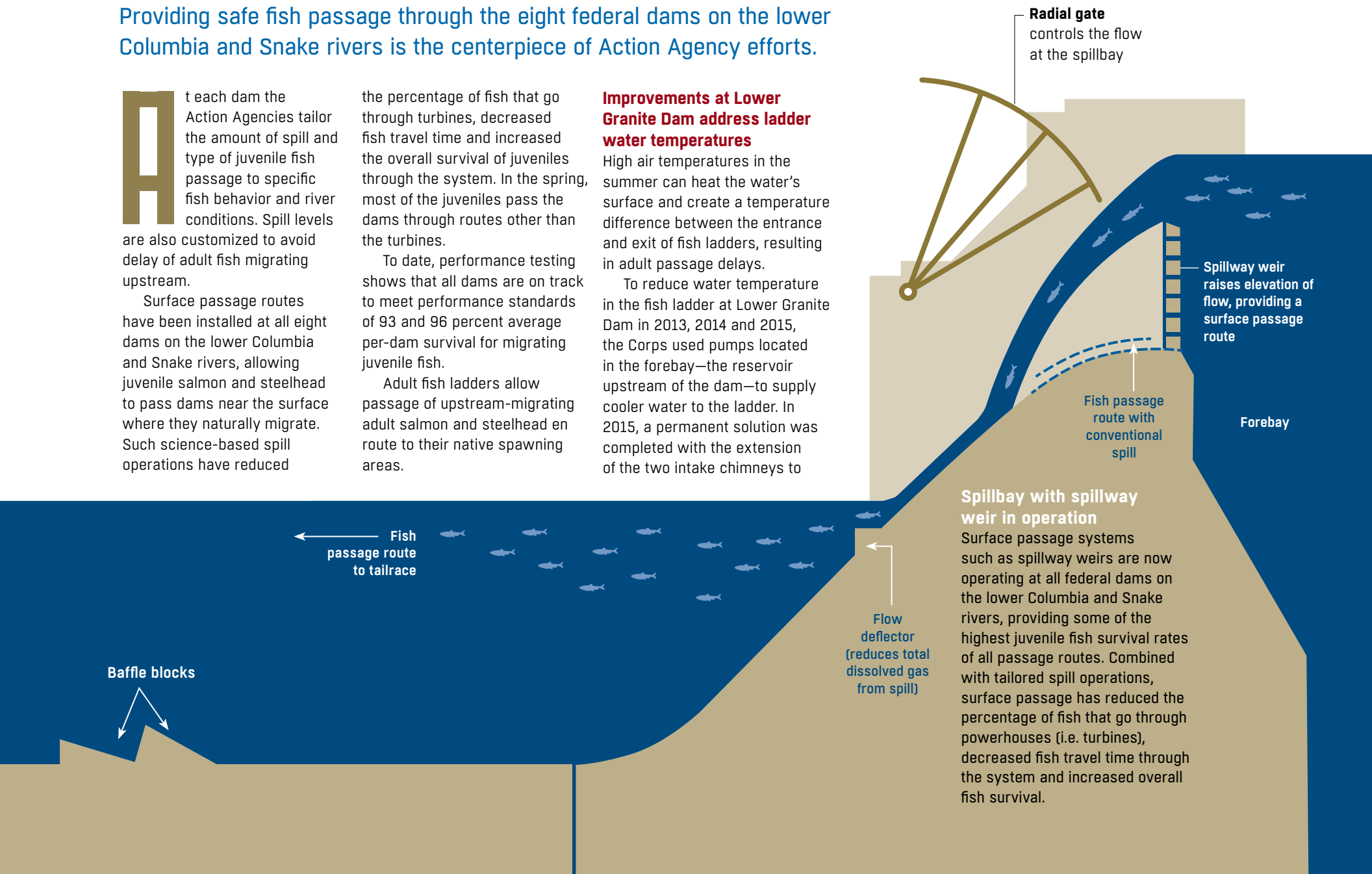
To date, performance testing shows that all dams are on track to meet performance standards of 93 and 96 percent average per-dam survival for migrating juvenile fish.

Adult fish ladders allow passage of upstream-migrating adult salmon and steelhead en route to their native spawning areas.

Improvements at Lower Granite Dam address ladder water temperatures

High air temperatures in the summer can heat the water's surface and create a temperature difference between the entrance and exit of fish ladders, resulting in adult passage delays.

To reduce water temperature in the fish ladder at Lower Granite Dam in 2013, 2014 and 2015, the Corps used pumps located in the forebay—the reservoir upstream of the dam—to supply cooler water to the ladder. In 2015, a permanent solution was completed with the extension of the two intake chimneys to



Spillbay with spillway weir in operation

Surface passage systems such as spillway weirs are now operating at all federal dams on the lower Columbia and Snake rivers, providing some of the highest juvenile fish survival rates of all passage routes. Combined with tailored spill operations, surface passage has reduced the percentage of fish that go through powerhouses (i.e. turbines), decreased fish travel time through the system and increased overall fish survival.

pull even cooler water from deeper in the forebay. The cooler water, which can be partially attributed to cold water released from Dworshak Dam, was used to cool the ladder as well as the exit area in the forebay. A similar temporary pump system was also used in 2016 at Little Goose Dam.

To address climate impacts, the Action Agencies will continue to use available tools, such as Dworshak Dam cold water releases, to help improve migration conditions for fish moving through the hydro system.

Innovative turbines will further improve fish passage at Ice Harbor Dam.

Innovative turbines will further improve juvenile survival on the Snake River

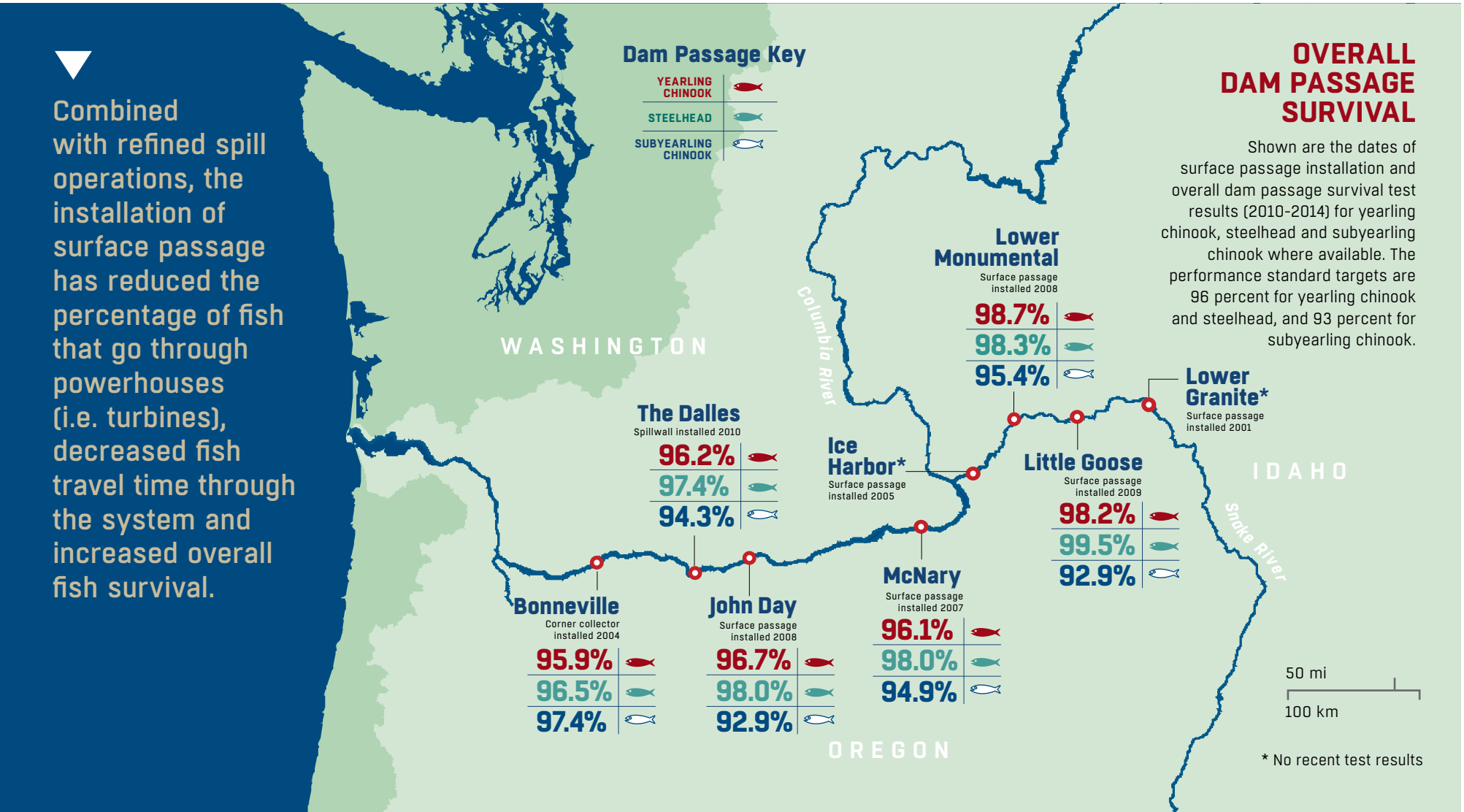
The majority of juvenile salmon and steelhead migrating in-river pass the Columbia and Snake river dams via surface weirs, spillways or bypass routes. The remaining small percentages that pass through turbines run the risk of injury or disorientation from pressure changes.

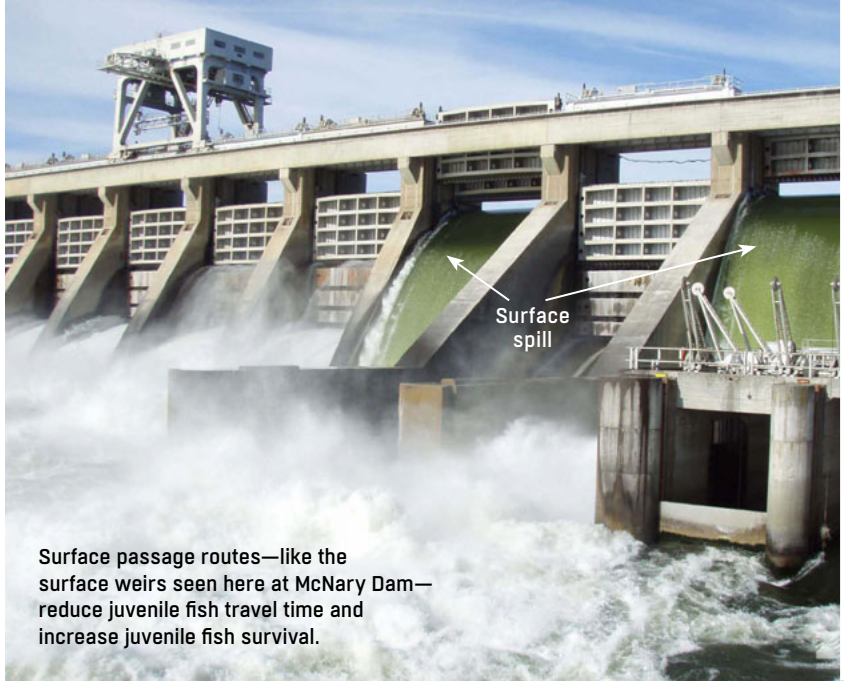
The Action Agencies have overseen the construction of two innovative turbines designed specifically to provide safer passage for young fish that pass through Ice Harbor Dam, further improving juvenile survival. Following testing, the turbine design will be available for use at other dams.

Combined with refined spill operations, the installation of surface passage has reduced the percentage of fish that go through powerhouses (i.e. turbines), decreased fish travel time through the system and increased overall fish survival.

OVERALL DAM PASSAGE SURVIVAL

Shown are the dates of surface passage installation and overall dam passage survival test results (2010-2014) for yearling chinook, steelhead and subyearling chinook where available. The performance standard targets are 96 percent for yearling chinook and steelhead, and 93 percent for subyearling chinook.





Surface passage routes—like the surface weirs seen here at McNary Dam—reduce juvenile fish travel time and increase juvenile fish survival.

Top: The percentage of fish that are transported has declined significantly in recent years.

Bottom: Young salmon and steelhead are outfitted with small tags, enabling scientists to study how long it takes the fish to travel to the ocean.

Spill through surface passage increases and more fish migrate in-river

Juvenile fish transportation is an ongoing program to improve fish survival by collecting fish from juvenile bypass facilities at Lower Granite, Little Goose and Lower Monumental dams and transporting them by either barge or truck to release sites below Bonneville Dam. Since transportation effectiveness varies greatly by species and time of year, the timing of collection and transport is decided annually in consultation with NOAA. In 2010 transportation operations were discontinued at McNary Dam so Columbia River stocks are no longer transported from there.

Since the 2008 BiOp has been in place, transportation rates have decreased substantially.

An average of 33 percent of the Snake River spring chinook and 35 percent of the Snake River steelhead runs have been transported in recent years. Before 2008, those stocks were transported at an average rate of 75 percent and 83 percent respectively.

The installation of surface passage structures in spillways, operational changes that attract fish to the spillways and variable arrival timing of juveniles have all contributed to the reduced transportation rates.

Balancing transportation and hydro operations for juvenile fish helps spread the risk while Action Agency evaluations of transport continue.

▶ Spill through surface passage has contributed to the reduced transportation rates.

Juveniles are now traveling through the hydro system more quickly

Despite it being a very low flow year, in the spring of 2015 the time it took for yearling chinook and juvenile steelhead to travel through the hydropower system was shorter than the 2003- 2007 average for most of the migration season.

Travel time improvements are attributed to science-based spill through surface passage routes as well as tailored changes to spill operations.

Travel time through the system was shorter for young steelhead than for yearling chinook. This could be a result of steelhead using surface passage routes at a higher rate compared to chinook. Because juvenile chinook tend to migrate to the ocean more quickly as the season progresses, date within the migration season is now a stronger predictor of travel time than either flow or spill.

Surface passage operations such as the Bonneville Dam corner collector provide more natural conditions for juvenile fish passage.

BARGE PHOTO: NORTHWEST POWER & CONSERVATION COUNCIL

LITTLE GOOSE DAM
Yearling chinook 2012 passage and survival estimates*

98.2%

OVERALL DAM SURVIVAL

Juvenile fish travel past dams by many routes: through turbines, juvenile bypass systems, spillways, or by collection and transport in barges or trucks downstream. Juvenile survival rates vary by route, as seen here at Little Goose Dam. Performance-standard testing at Little Goose Dam in 2012 estimated overall survival for juvenile spring Chinook at 98.2 percent. Performance-standard testing results range from 95.97 percent to 98.68 percent survival for spring chinook at the lower Columbia and Snake River dams. The BiOp performance standard is 96 percent average per-dam survival for spring chinook.

* 2012 is the most recent year of performance standard testing at Little Goose Dam.

21% Spillway Passage
44% Surface Weir Passage
4% Turbine Passage
31% Bypass Passage
95% Spillway Survival
100% Surface Weir Survival
87% Turbine Survival
99% Bypass Survival
Snake River

GOOGLE AERIAL IMAGERY.

Hundreds of tributary improvements increase quality and availability of fish habitat

Eight years into the 10-year term of the BiOp, the Action Agencies and their partners have already met or exceeded the habitat improvement goals in the BiOp for 75 percent (42 of 56) of the individual tributary subpopulations of salmon and steelhead.

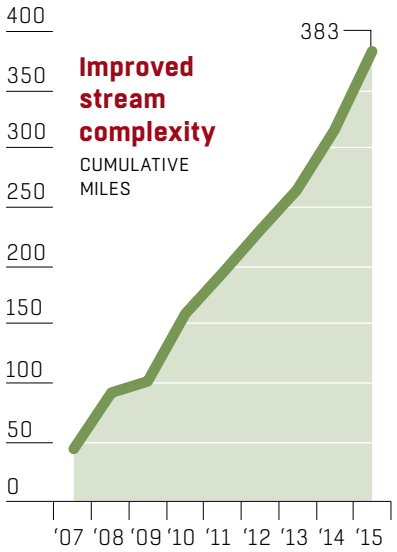
The Action Agencies work with states, tribes and watershed groups to identify and implement actions to improve salmon and steelhead spawning and rearing habitat, targeting factors that limit fish survival.

The Action Agencies have funded hundreds of projects across the basin to restore natural stream channels, enhance flow volume and timing, expand cold water refuges and open access to habitat. This work has been done over a broad landscape, including areas that present restoration challenges due to significant legacy impacts such as dredge mining and disconnected floodplains.

The habitat actions provide both near-term and long-term benefits, including those that will help mitigate the effects of climate change. Actions that improve connectivity and streamflow will provide a buffer against the effects of climate change.

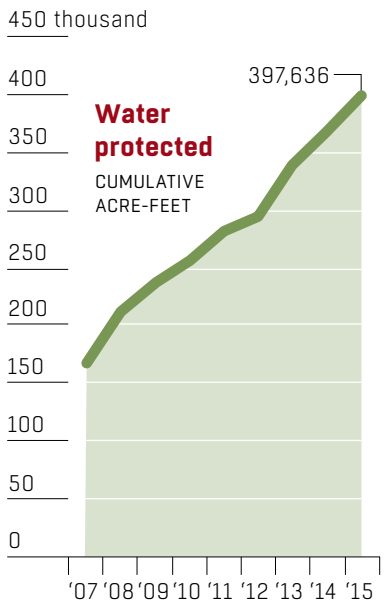
Restoring stream complexity creates more natural conditions for fish

Through the end of 2015, the Action Agencies and partners have improved 15,460 acres of riparian habitat—the equivalent to an area three times larger than Portland's Forest Park. They have improved 383 miles of streams—a length greater than the distance between Spokane, Washington and Boise, Idaho—by restoring complex habitats and enhancing floodplains and side channels. Salmon and steelhead are spawning and rearing in the newly improved reaches and studies frequently show increases in abundance following treatment.



Water restored to streams increases salmon and steelhead habitat

Through water transactions and irrigation improvements, Action Agencies and partners have secured almost 400,000 acre feet of water to Columbia River Basin streams, increasing flow to important salmon habitat. This is more than double the annual water usage of the entire city of Seattle. These flow improvements have been demonstrated to benefit fish survival by increasing available fish habitat.




The Catherine Creek Complex is a collaboration among fish managers and farmers to improve habitat for ESA-listed fish, while continuing to serve agricultural uses.


A project on Nason Creek elevated railroad track on a 90-foot bridge enabling the reconnection of 152 acres of historic floodplain and three small tributaries.


After extensive restoration efforts including the construction of a 1,900-foot channel, adult salmon returned to spawn on the middle fork of the John Day River.

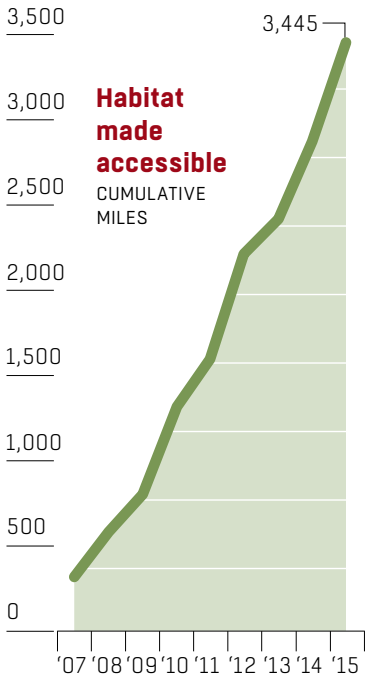

On the Tucannon River, large woody debris helps re-establish a more natural streamflow, reconnect floodplain habitat and increase habitat complexity.

Tributary and estuary habitat projects benefit salmon and steelhead

The Columbia River Basin habitat program is among the largest and most comprehensive programs in the nation. The BiOp identifies specific habitat quality improvement targets for 56 populations of salmon and steelhead focused on alleviating key limiting factors and improving abundance. Habitat projects are implemented in the estuary and tributaries throughout the Columbia Basin. BiOp and non-BiOp habitat projects depicted here are underway in areas where ESA-listed fish covered by the BiOp originate.

Habitat miles opened up—equivalent to nearly three times the length of the Columbia River

Through 2015, the Action Agencies and their partners have opened 3,445 miles of important spawning and rearing habitat by eliminating culverts and water diversions. Science shows that improving habitat access is one of the restoration activities that salmon and steelhead can respond to most quickly.



A healthy estuary is vital to young fish

Productive habitat in the Columbia River estuary is vital to the life cycle of salmon and steelhead. The nutrient-rich habitat of a healthy estuary provides food and refuge for young salmon as they transition to life in the ocean. Fish that feed in the estuary are more likely to survive the transition and the challenges of a life at sea.

The Action Agencies work with partners to restore historical tidally influenced floodplain connectivity because of the substantial ecological benefits associated with these types of projects. Research shows that juvenile salmon can benefit from both increased access to reconnected habitat, as well as the nutrients that flow from the restored site to the river. Through the removal or lowering of dikes and levees, restoration of historical channels and native revegetation efforts, Action Agency projects re-establish critical floodplain connections and increase access to rearing habitat.

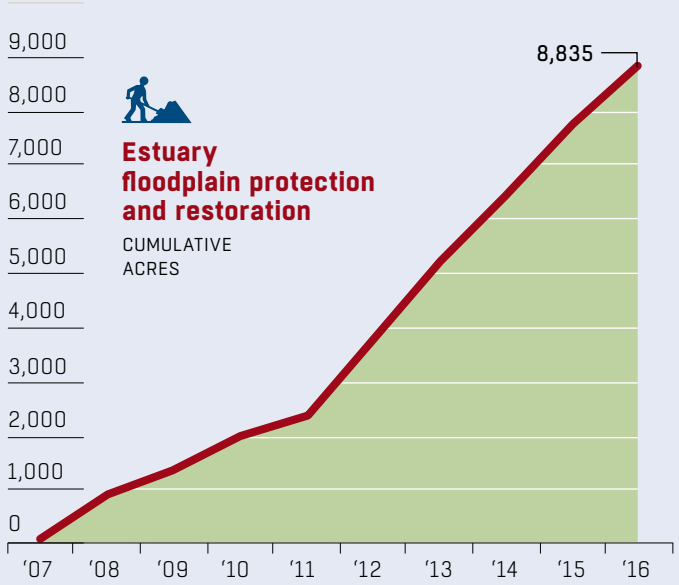
Restoration monitoring results show that juvenile salmon move into the reconnected areas within a year of reconnection.

In addition to restoration actions, the Action Agencies work with willing landowners to protect land by putting it under permanent conservation easement to further support habitat and fish conservation in the short and long term. Estuary projects can be complex, often involving a diversity of landowners and issues and requiring lengthy environmental and design reviews.

▲ By lowering and removing levees and re-creating historical channels, project partners are reconnecting 196 acres of floodplain habitat at the confluence of the Youngs and Wallooskee rivers. Measuring fish response to reconnected habitats is one of several tools used to evaluate the success of restoration actions..

Agencies and partners have removed levees and restored historic channels to reconnect more than 450 acres of floodplain habitat on both sides of the East Fork Lewis River.

Fish are now able to access 329 acres of restored wetlands on Sauvie Island thanks to the removal of three culverts, channel restoration and the installation of a bridge.



Estuary floodplain protection and restoration

CUMULATIVE ACRES

▶ Measuring fish growth in reconnected habitats is one of several tools used to evaluate the success of restoration actions.

Hatchery programs conserve natural fish

The Action Agencies fund dozens of hatchery programs for species conservation that increase abundance, preserve genetic diversity and reduce the extinction risk of ESA-listed species.

One of the most notable is the Snake River sockeye safety-net conservation program, in which state and tribal partners carefully manage a captive broodstock population. This hatchery provided a critical safety net in 2015, when low snowpack combined with record-setting air temperatures resulted in elevated water temperatures and high mortality of sockeye throughout the basin. Of the estimated 4,069 adult Snake River sockeye that passed Bonneville Dam only 56 successfully made the journey to Idaho's Sawtooth Valley.

Using a combination of captive broodstock and naturally returning adults, the Snake River sockeye program met its production goal of approximately 750,000 smolts. In addition, remaining captive adult fish were released to spawn naturally in Redfish and Pettit lakes. This important safety-net conservation hatchery helps ensure that the endangered population of sockeye will survive in the future.

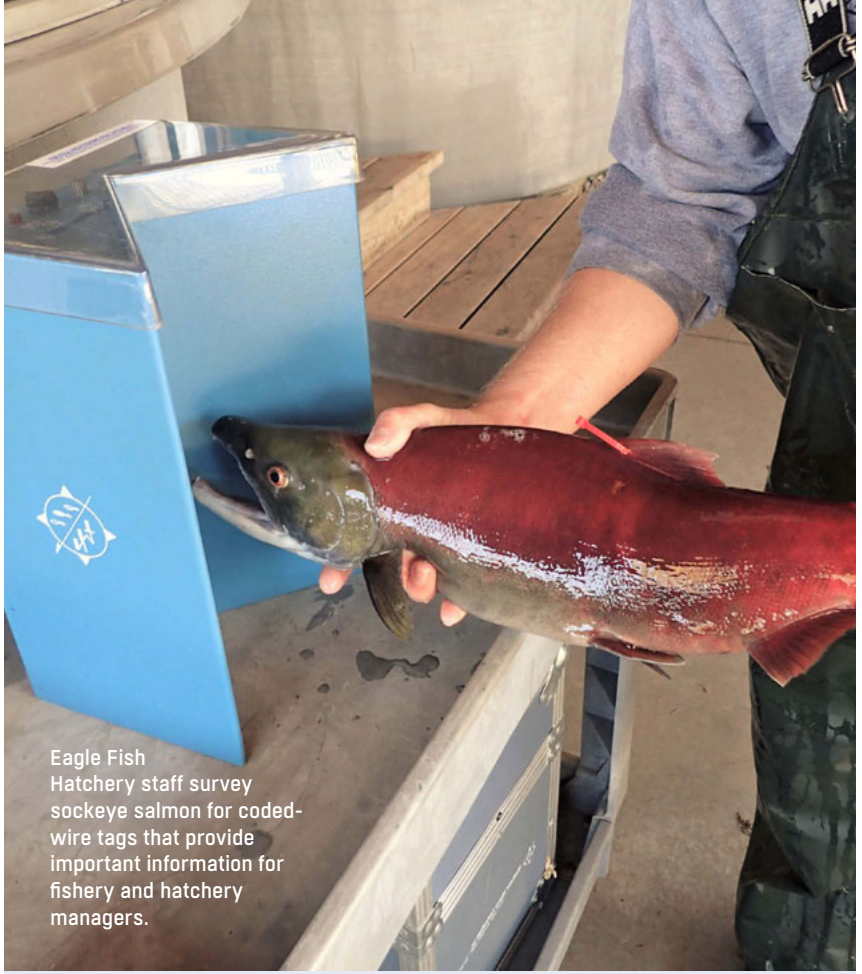
In recent years, other safety-net hatchery programs supporting Upper Grande Ronde, Lostine River and Catherine Creek spring chinook successfully met their goals of 150 natural-origin adults returning to spawn and have since shifted to conventional conservation hatchery programs that do not maintain a captive broodstock.

Adaptive management helps ensure that these programs and other hatchery mitigation programs do not impede the recovery of naturally spawning fish. For example, the Methow Upper Columbia steelhead program, using locally adapted Methow River broodstock, has transitioned the program to more closely align with the life history of natural origin steelhead by releasing smolts that are two years old instead of one year old.

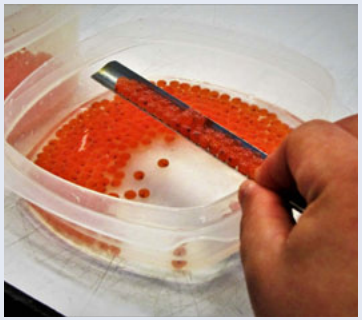
Kelt reconditioning supports steelhead productivity

The reconditioning of kelts—steelhead that survive to spawn again in subsequent years—is a conservation tool to improve the productivity, diversity and demographic stability of steelhead in the Columbia and Snake rivers. More than 2,300 repeat spawning steelhead have been successfully reconditioned and released in the upper Columbia, mid Columbia and the Snake river basins thanks to tribal partner projects funded by the Action Agencies.

IDFG



Eagle Fish
Hatchery staff survey sockeye salmon for coded-wire tags that provide important information for fishery and hatchery managers.



▲ Conservation hatcheries can preserve genetic diversity and help ensure that stocks of protected salmon and steelhead survive into the future.

UNIVERSITY OF IDAHO/LAURA JENKINS

▲ Thanks to Action Agency-supported efforts by tribes and partners, more than 2,300 kelts have been successfully reconditioned and released to spawn a second time.

Predation management actions benefit juvenile and adult salmon

The Action Agencies continue to make progress reducing the number of juvenile salmon and steelhead consumed by predators, though an increasing number of sea lions threaten to undermine agency efforts.

Pikeminnow predation on juvenile salmon has declined an estimated 38 percent since the successful sport reward program began in 1990. An estimated 3 to 5 million young salmon have been saved annually since that time.

The number of sea lions seen at Bonneville Dam during spring monitoring nearly doubled between 2014 and 2015, jumping from 137 to 264 animals. Monitoring results in 2015 showed that the increased number of sea lions consumed 4 percent of all salmon and steelhead counted at Bonneville Dam from Jan. 1 through May 31. The Action Agencies continue to work with states and tribes to deter sea lions from the Bonneville tailrace—the area immediately downstream of the dam. Sea lion exclusion gates have been effective at keeping the marine mammals from entering the fishways.

Management actions have significantly reduced the Caspian tern predation rate on upper Columbia River steelhead and upper Columbia River spring chinook at Goose Island near Othello, Washington. Similar efforts have reduced the Crescent Island predation rate to less than 0.1 percent. In 2015, Action Agencies completed development of new nesting habitat at Don Edwards National Wildlife Refuge in San Francisco Bay. However, during 2015 the historically small Caspian tern colony on the Blalock Islands in John Day reservoir increased in size, offsetting much of the benefit from the reduction of the colonies on Goose and Crescent Islands.

The Action Agencies reduced the nesting habitat of Caspian terns on East Sand Island, resulting in the smallest number of breeding pairs since the initiation of reductions in tern nesting habitat on the island in 2008. Experts anticipate more terns will opt to nest at the alternative habitat sites created outside the Columbia River Basin.

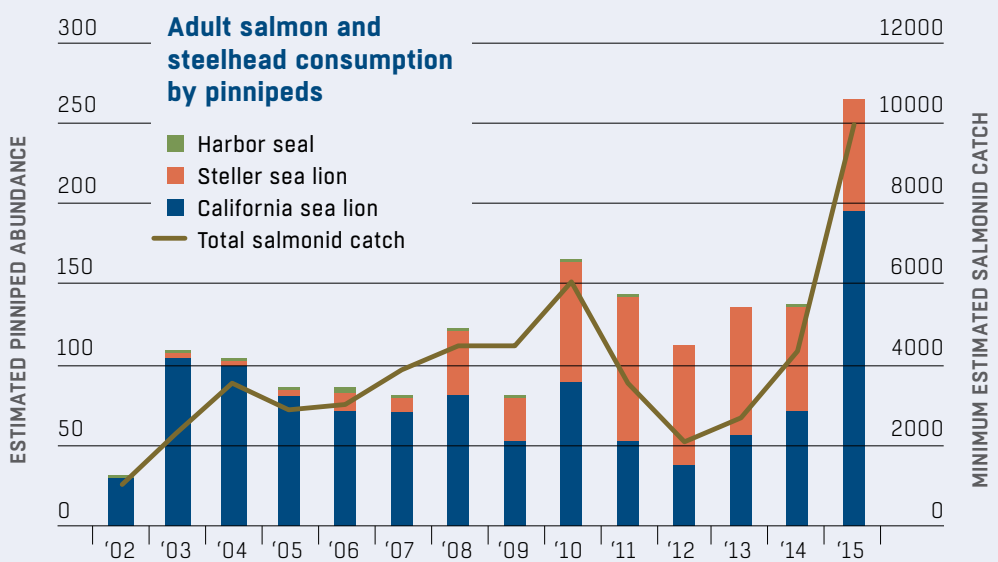
Management actions are beginning to address double-crested cormorant predation rates, which in 2015 were the highest on record at East Sand Island for some stocks of salmon and steelhead. The 2015 colony consisted of about 12,150 breeding pairs, down from 2014 and 2013, but higher than the 2000–2013 average.

Salmon predation by cormorants on East Sand Island was the highest on record in 2015.

The pikeminnow sport reward program has saved 3 to 5 million young salmon every year since it began.

The amount of salmon estimated to have been consumed by pinnipeds nearly doubled between 2014 and 2015.

Management actions continue to reduce Caspian tern predation rates at islands in the estuary and river.



PIKEMINNOW PHOTO: PSMFC. CASPIAN TERN: BIRD RESEARCH NORTHWEST

Planning for the future of climate change

As global climate change takes hold in the Pacific Northwest, temperatures and streamflow patterns are likely to change and affect the suitability of rivers and streams for salmon.

Warming winter temperatures mean that more precipitation will fall as rain instead of snow, making the snowpack and streamflow more variable from year to year and creating challenges for conservation of fish and wildlife, and the ecosystems on which they rely. Salmon depend on cold water. Streamflows that peak earlier in the year will leave less cold water available to support summer and fall flows for migrating fish.

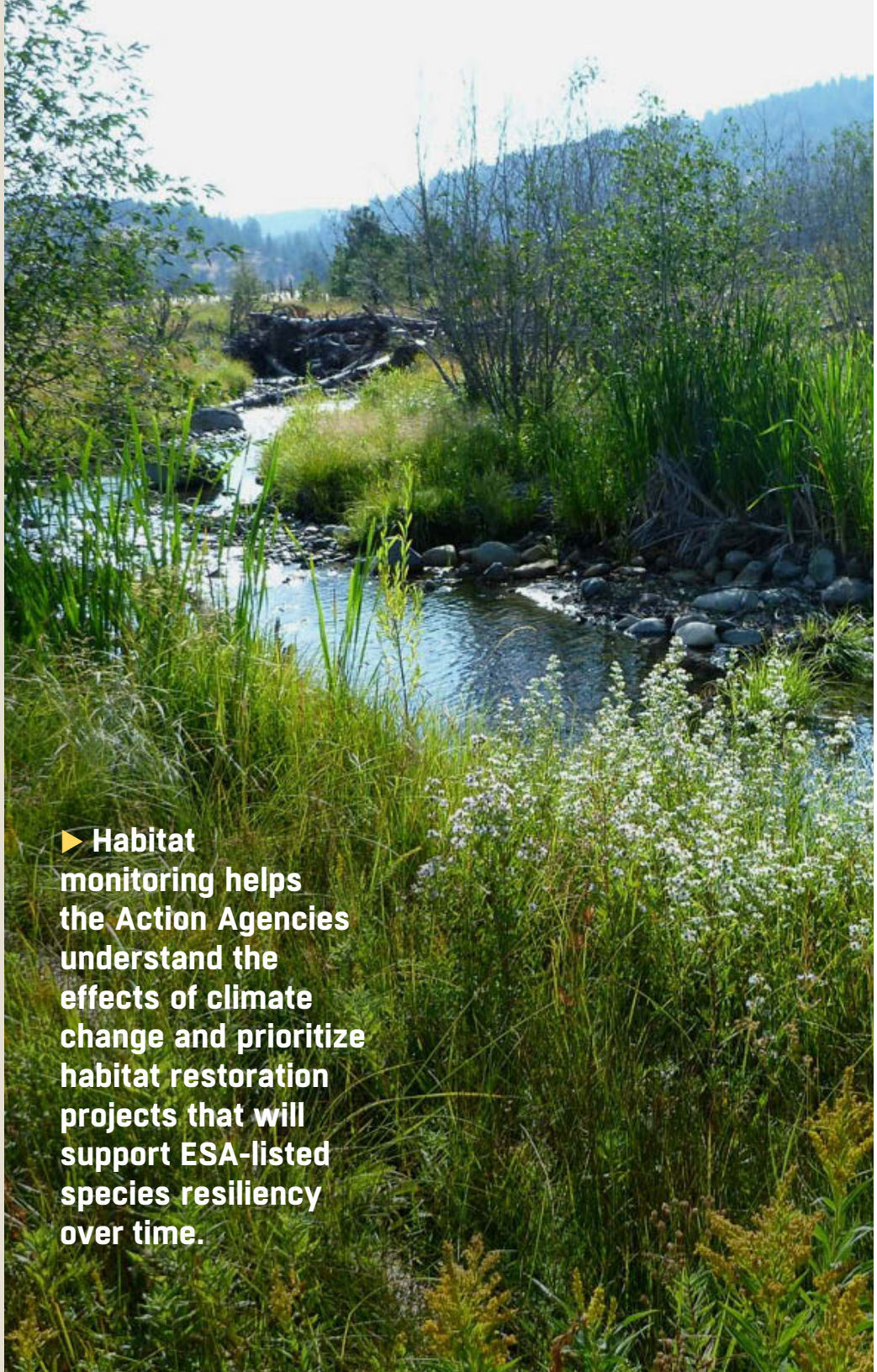
Salmon life histories are complex and adaption to climate change could be occurring. The Action Agencies and their partners continue to monitor fish populations for such adaptations.

The Action Agencies incorporate climate change forecasts into their hydrologic, hydraulic and water quality modeling, and work to increase the availability of cold-water refuges in tributaries through habitat restoration efforts.

Habitat monitoring helps the Action Agencies understand the effects of climate change and prioritize habitat restoration projects that will support ESA-listed species resiliency over time. Using this information, the Action Agencies are buffering the effects of climate change through their habitat actions.

Land purchases and conservation easements protect streamside habitat. Water transactions and irrigation improvements help keep water in streams. Plantings provide shade and habitat complexity, support diverse prey populations and offer other benefits to fish.

Partnerships among agencies, tribes and other public, private and nongovernmental stakeholders are critical to understanding, preparing for and minimizing the potential effects of a changing climate.



▶ Habitat monitoring helps the Action Agencies understand the effects of climate change and prioritize habitat restoration projects that will support ESA-listed species resiliency over time.

U.S. Army Corps of Engineers
Northwestern Division
Portland, Oregon

Bonneville Power Administration
Portland, Oregon

Bureau of Reclamation
Pacific Northwest Regional Office
Boise, Idaho

For an electronic copy of this report or to learn more about the federal agencies' work to protect fish and wildlife, go to:

Columbia Basin Federal Caucus
http://www.salmonrecovery.gov

For more information on what our partners are doing throughout the Columbia Basin, go to:

Columbia River Inter-Tribal Fish Commission: http://www.critfc.org

Idaho Office of Species Conservation:
http://www.species.idaho.gov

Northwest Power and Conservation Council:
http://www.nwcouncil.org

Oregon Watershed Enhancement Board:
http://www.oregon.gov/OWEB/

Pacific Coastal Salmon Recovery Fund:
http://www.nwr.noaa.gov

Upper Columbia United Tribes:
http://www.ucut.org

Washington Salmon Recovery Office:
http://www.rco.wa.gov/

Thank you to our many state, local and tribal partners throughout the Columbia Basin.

Cover Photos
Center: Snake River sockeye; top left: reconnected floodplain at Kandoll Farms in Wahkiakum County, Washington; center left: surface passage through spillway weirs at McNary Dam; bottom left: restoration at Oxbow Conservation Area in Grant County, Oregon.

FEBRUARY 2017. GRAPHIC DESIGN BY LUIS PRADO